

COMBINED STATEMENT ON WEIGHT MANAGEMENT AND TYPE 2 DIABETES FROM THE AMERICAN DIABETES ASSOCIATION, THE NORTH AMERICAN ASSOCIATION FOR THE STUDY OF OBESITY AND THE AMERICAN SOCIETY FOR CLINICAL NUTRITION

Weight management through lifestyle modification for the prevention and management of type 2 diabetes: rationale and strategies. A statement of the American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition^{1,2,3}

Samuel Klein, Nancy F Sheard, Xavier Pi-Sunyer, Anne Daly, Judith Wylie-Rosett, Karmeen Kulkarni and Nathaniel G Clark

¹ From the Division of Geriatrics and Nutritional Sciences and Center for Human Nutrition, Washington University School of Medicine, St Louis (SK); the Department of Family Practice, University of Vermont, Burlington (NFS); the Division of Endocrinology, Diabetes and Nutrition, St Luke's- Roosevelt Hospital Center, Columbia University College of Physicians and Surgeons, New York (XP-S); the Springfield Diabetes & Endocrine Center, Springfield, IL (AD); the Division of Health, Behavior and Nutrition, Albert Einstein College of Medicine, Bronx, NY (JW-R); St Mark's Diabetes Center, Salt Lake City, UT (KK); and the American Diabetes Association, Alexandria, VA (NGC)

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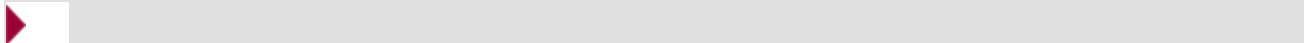
³ Reprints not available. Address correspondence to NG Clark, American Diabetes Association, 1701 North Beauregard Street, Alexandria, VA 22311. E-mail: nclark@diabetes.org.

ABSTRACT

Overweight and obesity are important risk factors for type 2 diabetes. The marked increase in the prevalence of overweight and obesity is presumably responsible for the recent increase in the prevalence of type 2 diabetes. Lifestyle modification aimed at reducing energy intake and increasing physical activity is the principal therapy for overweight and obese patients with type 2 diabetes. Even moderate weight loss in combination with increased activity can improve insulin sensitivity and glycemic control in patients with type 2 diabetes and prevent the development of type 2 diabetes in high-risk persons (ie, those with impaired glucose tolerance). The American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition have joined together to issue this statement on the use of lifestyle modification in the prevention and management of type 2 diabetes.

Key Words: Weight management • lifestyle modification • type 2 diabetes • obesity

INTRODUCTION



The prevalence of diabetes in the United States continues to rise by epidemic proportions. This increase parallels the rising rates of obesity and overweight observed over the past decade ([1](#), [2](#)). Indeed, as body mass index (BMI; in kg/m²) increases, the risk of developing type 2 diabetes increases in a dose-dependent manner ([3](#), [4](#)). The prevalence of type 2 diabetes in obese adults is 3–7 times that in normal-weight adults, and those with a BMI > 35 are 20 times as likely to develop diabetes as are those with a BMI between 18.5 and 24.9 ([5](#), [6](#)). In addition, weight gain during adulthood is directly correlated with an increased risk of type 2 diabetes ([3](#), [7–9](#)).

Obesity also complicates the management of type 2 diabetes by increasing insulin resistance and blood glucose concentrations ([10](#)). Obesity is an independent risk factor for dyslipidemia, hypertension, and cardiovascular disease ([6](#), [11–14](#)) and, thus, increases the risk of cardiovascular complications and cardiovascular mortality in patients with type 2 diabetes ([15](#)).

The purpose of this statement is to review the important role of weight management in the prevention and management of type 2 diabetes and to describe strategies for achieving and maintaining a healthy body weight through lifestyle modification. The use of weight-loss medications and bariatric surgery in the management of obesity will not be discussed in this document. Pharmacotherapy can be a useful adjunct to lifestyle modification in the long-term management of obesity in selected patients ([16](#)). Weight-loss medications may be considered for those with a BMI ≥ 30 or those with a BMI ≥ 27 plus obesity-related comorbid conditions. Weight-loss surgery may be a therapeutic alternative for patients with a BMI ≥ 40 or with a BMI ≥ 35 plus comorbid conditions ([16](#)). Comprehensive review articles that discuss the use of weight-loss medications and surgery in the management of obesity were recently published ([17–20](#)).

Benefits of weight loss

Weight loss is an important goal for overweight and obese persons, particularly those with type 2 diabetes because it improves glycemic control ([21](#)). Moderate weight loss (5% of body weight) can improve insulin action, decrease fasting blood glucose concentrations, and reduce the need for diabetes medications ([22–28](#)). Moreover, improvements in fasting blood glucose are directly related to the relative amount of weight lost ([28](#)). Moderate weight loss may not improve glycemic control in all obese patients with diabetes ([29](#)); however, it is possible that patients with long-standing disease or severe pancreatic β cell dysfunction are not as responsive to weight loss as are those with less extensive disease. Marked weight loss (30% of body weight) after gastric bypass surgery can normalize glycemic control in more than two-thirds of extremely obese patients with type 2 diabetes ([30–33](#)).

Weight loss has important additional health benefits in patients with diabetes because it improves other risk factors for cardiovascular disease ([22–27](#)) by decreasing blood pressure ([34–38](#)), improving serum lipid concentrations (decreases in serum triglycerides, total cholesterol, and LDL-cholesterol concentrations and increases in serum HDL-cholesterol concentrations) ([39–42](#)), and reducing serum markers of inflammation ([43](#), [44](#)).

Moderate weight loss and increased physical activity can prevent or delay the development of type 2 diabetes in high-risk groups, such as those with impaired glucose tolerance ([45–47](#)). For example, data from the Diabetes Prevention Program indicate that weight loss (7% of weight loss in the first year) and increased physical activity (150 min of brisk walking per week) reduced the 4-y incidence of type 2 diabetes by 58% in men and women with impaired glucose tolerance ([45](#)). Lifestyle changes were nearly twice as effective as was metformin therapy (31% reduction in incidence of diabetes) in preventing type 2 diabetes ([45](#)).

Indications and goals for weight-loss therapy

Weight loss is recommended for all overweight (BMI = 25.0–29.9) or obese (BMI \geq 30.0) adults who have type 2 diabetes or who are at risk of this disease (**Table 1**). It is important to set a weight-loss goal that is both achievable and maintainable. Even a moderate weight loss of 5% of body weight can produce significant health benefits ([16](#), [24](#), [49–51](#)) and may be a reasonable initial goal for most patients. Better outcomes for long-term weight reduction occur when a reduced-calorie diet is combined with increased physical activity and behavior therapy that is aimed at developing skills required to successfully change problematic eating and activity patterns ([16](#), [52](#)).

View this table: **TABLE 1** Risk factors for type 2 diabetes¹
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Diet

Weight loss occurs when energy expenditure exceeds energy intake. An energy deficit of 500–1000 kcal/d will result in a loss of \approx 1–2 lb/wk (\approx 0.45–0.90 kg/wk) and an average total weight loss of \approx 8% after 6 mo ([16](#)). Although weight regain is common, approximately two-thirds of weight that is lost by dieting is maintained at 1 y ([53](#)). Severe calorie restriction by means of a very-low-calorie diet (<800 kcal/d) causes rapid weight loss, \approx 15–20% of body weight within 4 mo. However, very-low-calorie diets are not recommended for most patients because they do not result in greater long-term weight loss and are associated with a higher risk of developing medical complications, such as gallstones, than are low-calorie diets ([54–56](#)). The National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel recommends the use of a low-calorie diet that generates an initial deficit of 500–1000 kcal/d and supplies \geq 1000–1200 kcal/d for women and 1200–1600 kcal/d for men to treat obesity ([52](#)). An alternative approach for determining suggested energy intake goals for weight loss based on current body weight is shown in **Table 2** ([17](#)).

View this table: **TABLE 2** Alternative approach for estimating energy intake goal of initial weight-loss diet¹
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A variety of diets have been proposed to treat obesity. Although many different dietary approaches may result in short-term weight loss, the limitations of most diets are poor long-term compliance and weight regain. The optimal dietary macronutrient composition that facilitates lasting and safe weight loss is not known ([16](#)).

A low-fat (eg, 25–30% of calories from fat) diet is considered the conventional therapy for treating obesity. Data obtained from obese persons who were successful at maintaining long-term weight loss ([57](#)), diet intervention trials designed to decrease the risk of cardiovascular disease ([58](#)), and randomized controlled trials that evaluated diet therapy for obesity ([59](#)) indicate that decreases in dietary fat intake (to 25–30% of total calories) results in decreased total energy intake and weight loss. Data regarding the long-term effect of a very-low-fat diet (\leq 15% of total calories from fat) on weight loss are limited because few studies have successfully achieved this level of intake ([60](#)). Additionally, in some diabetic patients, the concomitant increase in carbohydrate intake can exacerbate dyslipidemia (elevated triglycerides and low HDL-cholesterol concentrations), which is frequently associated with insulin resistance and type 2 diabetes ([61–64](#)).

Recently, there has been increased interest in the use of low-carbohydrate diets as potential therapy for obesity. The results of 5 randomized controlled trials in adults ([65–69](#)) found that subjects randomly assigned to a low-carbohydrate, high-protein, high-fat diet (≈25–40% of calories from carbohydrate) achieved greater short-term (6 mo) ([65–67](#)), but not long-term (12 mo) ([65, 68](#)), weight loss than did those randomly assigned to a low-fat diet (≈25–30% of calories from fat and 55–60% of calories from carbohydrate). The data from these studies also found greater improvements in serum triglycerides and HDL-cholesterol concentrations but not in serum LDL-cholesterol concentrations in the low-carbohydrate group than in the low-fat group. In addition, glycemic control was better with low-carbohydrate than with low-fat diet therapy in subjects with type 2 diabetes ([66, 68](#)). Data from a study conducted in overweight adolescents found that altering the dietary glycemic load by reducing the total carbohydrate content (45–50% of energy intake) and consuming foods with a low glycemic index resulted in greater weight loss than did a conventional low-fat diet (25–30%) ([70](#)). Additional research is needed to clarify the long-term efficacy and safety of low-carbohydrate diets, particularly in patients with diabetes.

It is unlikely that one diet is optimal for all overweight and obese persons. Dietary guidance should be individualized to allow for specific food preferences and individual approaches to reducing energy intake ([21, 52](#)). A variety of strategies are available for decreasing energy intake. For example, lowering the energy density of the diet (eg, by increasing fruit and vegetable intakes and limiting foods that are high in fat) can reduce energy intakes while maintaining a volume of food that might help control hunger ([71](#)). Improvements in portion control—by reducing portion sizes ([71](#)), using meal-replacement products ([41, 72, 73](#)), and following structured meal plans ([74, 75](#))—can also enhance compliance with energy-deficit diets.

The American Diabetes Association, the North American Association for the Study of Obesity, and the American Society for Clinical Nutrition recommend setting an energy intake goal to achieve a 500–1000 kcal/d energy deficit with a food intake pattern consistent with current recommendations for reducing the risk of comorbidities associated with obesity. Therefore, we recommend that the macronutrient content of the diet be based on current dietary guidelines from the American Diabetes Association ([21](#)) and the American Heart Association ([76](#)) (**Table 3**) and the National Cholesterol Education Program Adult Treatment Panel ([77](#)) (**Table 4**). These recommendations are based on current evidence regarding the effects of dietary intervention in reducing several coronary heart disease risk factors, including hypertension and elevated LDL-cholesterol concentrations ([76, 77](#)), which are important for patients with type 2 diabetes because of their increased risk of cardiovascular disease ([77](#)). These recommendations may require modification, however, as new information is generated from additional diet intervention studies.

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TABLE 3 Dietary guidelines from the American Diabetes Association and the American Heart Association¹

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TABLE 4 Dietary recommendations from the National Cholesterol Education Program Expert Panel on Detection, Evaluation, and Treatment of High Blood Cholesterol in Adults¹

Physical activity

Physical activity is an important component of any weight-management program. Although energy restriction by dieting is largely responsible for initial weight loss ([16](#), [78](#), [79](#)), regular physical activity helps to maintain weight loss and to prevent weight regain ([52](#), [80](#)). Regular exercise and aerobic fitness also improve insulin sensitivity and glycemic control ([16](#), [81](#), [82](#)), may decrease the risk of the development of diabetes ([83](#)), and may reduce overall mortality in patients with type 2 diabetes ([84](#)).

The National Heart, Lung, and Blood Institute Obesity Education Initiative Expert Panel recommends 30–45 min of moderate-intensity aerobic physical activity (40–60% of maximal oxygen uptake, or 50–70% of maximum heart rate) 3–5 d/wk initially and then a gradual increase in the duration and frequency of the activity ([16](#)). This recommendation agrees with that of several other health organizations, including the Surgeon General's office, the American College of Sports Medicine, the American Diabetes Association, the American Heart Association, and the National Institutes of Health Consensus Development Panel on Physical Activity and Cardiovascular Health ([81](#), [85–88](#)). A greater reduction in cardiovascular disease risk would be anticipated by increasing either the duration or the intensity of physical activity ([89](#)). Data from most weight-loss studies suggest that 60–75 min of moderate-intensity activity (eg, walking) or 35 min of vigorous activity (eg, jogging) daily is needed to maintain long-term weight loss ([57](#), [80](#), [90](#)).

In previously inactive patients, an initial exercise program should be of short duration (ie, 10 min/d) and then gradually increase to 30 min/d of low-intensity activity ([16](#), [85](#)). The intensity can be increased as the patient's strength and fitness improve ([16](#), [91](#)). In developing a physical activity program, the clinician should devise a plan that can be maintained without injury on the basis of the patient's current level of activity and readiness to increase activity. All patients should be assessed regarding the need to undergo exercise stress testing before the initiation of a moderate-intensity exercise program ([87](#), [92–94](#)). Exercise testing should be performed at the discretion of the primary care physician before vigorous exercise is undertaken, particularly in patients with diabetes ([87](#), [94](#), [95](#)).

Compliance with a physical activity program is challenging. A structured exercise program that involves planned, repetitive exercise is not required for maintaining weight loss; increases in daily physical activity, such as walking and climbing stairs, is also effective ([96–98](#)). Exercising at home, rather than at a health club, eliminates the barriers of cost and travel time ([99](#)). Also, exercise does not need to occur in a single session to be beneficial; dividing activity into multiple short bouts produces similar benefits and can enhance compliance ([100](#), [101](#)).

Facilitating lifestyle change in an office practice

Making long-term changes in eating and activity behaviors is extremely difficult for most patients ([16](#)). The role of the clinician is to encourage, monitor, and support their patients during this process. The office environment should be sensitive to the needs of obese persons. Appropriate chairs, examination tables, and restrooms and specialized equipment, such as large blood pressure cuffs, extra-large gowns, and scales that measure weights >300 lb (>136.07 kg), should be available. The physician and office staff should always be sensitive and encouraging, even when patients have been unable to lose weight. It is important that patients feel understood and supported, not guilty or embarrassed, at office visits ([102](#)).

Several techniques can be used in the office setting to promote behavior change ([52](#), [103–105](#)). Initially, problem behaviors are identified, and specific realistic goals are agreed on. Setting small and achievable goals allows patients to experience success, which can be used as a foundation for additional lifestyle alterations. Strategies such as self-monitoring (daily records of food intake and physical activity), stimulus control

(avoiding triggers that prompt eating), and problem solving (identifying barriers and ways to overcome them) can support the change process during follow-up visits. Frequent patient-provider contact (eg, weekly or biweekly) is associated with better long-term weight-loss maintenance ([102](#)).

Providing appropriate behavior modification treatment within a clinical practice can be difficult because of the limited time and expertise of physicians. The enlistment of health care professionals (eg, nurses, medical assistants, or dietitians) to weigh patients, briefly review their records, and praise their efforts may be beneficial. Additionally, physicians may choose to refer patients to a Registered Dietitian, who has weight-management experience, or to a legitimate commercial or self-help program available in the local community. At the present time, third party reimbursement is available for medical nutrition therapy for diabetes but does not usually cover weight-loss therapy.

Maintaining weight loss

Long-term maintenance of weight loss is more challenging than is initial weight reduction ([102](#)). Some strategies that are associated with successful long-term weight loss include eating a diet low in calories (\approx 1400 kcal/d) and fat (24% of the total energy intake), frequently monitoring body weight, and participating in regular physical activity (equivalent to 2800 kcal/wk, or \approx 60 min of moderate activity/d) ([57](#), [80](#)). Successful weight-loss maintainers also reduced their portion sizes and snacking, ate breakfast daily, ate meals away from home \leq 3 times/wk, and watched television $<$ 3 h/wk on average ([53](#), [80](#)).

Summary

In summary, overweight and obesity are strongly linked to the development of type 2 diabetes and can complicate its management. Obesity is also an independent risk factor for hypertension and dyslipidemia as well as for cardiovascular disease, which is the major cause of death in persons with diabetes. Moderate weight loss improves glycemic control, reduces cardiovascular disease risk, and can prevent the development of type 2 diabetes in persons with prediabetes. Therefore, weight loss is an important therapeutic strategy in all overweight or obese persons with type 2 diabetes or who are at risk of developing diabetes.

Specific recommendations

Specific recommendations for the prevention and management of diabetes are listed below.

- 1) Weight loss is recommended for all overweight (BMI = 25.0–29.9) and obese (BMI \geq 30.0) adults who have, or who are at risk of developing, type 2 diabetes.
- 2) The primary approach for achieving weight loss is therapeutic lifestyle change, which includes a reduction in energy intake and an increase in physical activity.
- 3) A moderate decrease in caloric intake (500–1000 kcal/d) will result in a slow but progressive weight loss (1–2 lb/wk, or 0.45–0.90 kg/wk). For most patients, weight-loss diets should supply \geq 1000–1200 kcal/d for women and \geq 1200–1600 kcal/d for men.
- 4) Overweight and obese patients with diabetes are encouraged to adopt the dietary recommendations known to reduce the risk of coronary heart disease (outlined in Tables 3♦ and 4♦). In conjunction with a moderate reduction in caloric intake (500–1000 kcal/d), this diet is likely to result in moderate weight loss as well as improvements in cardiovascular disease risk factors. Dietary guidance should be tailored to each person, allowing for individual food preferences and approaches to reducing caloric intake.
- 5) Physical activity is an important component of a comprehensive weight-management program. Regular, moderate-intensity physical activity enhances long-term weight maintenance. Regular activity also improves

insulin sensitivity, glycemic control, and selected risk factors for cardiovascular disease (eg, hypertension and dyslipidemia), and increased aerobic fitness decreases the risk of coronary heart disease.

6) Initial physical activity recommendations should be modest, based on the patient's willingness and ability; thereafter, the duration and frequency should increase to 30–45 min of moderate aerobic activity 3–5 d/wk when possible. Greater activity levels of ≥ 1 h/d of moderate (walking) or 30 min/d of vigorous (jogging) activity may be needed to achieve successful long-term weight loss.

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